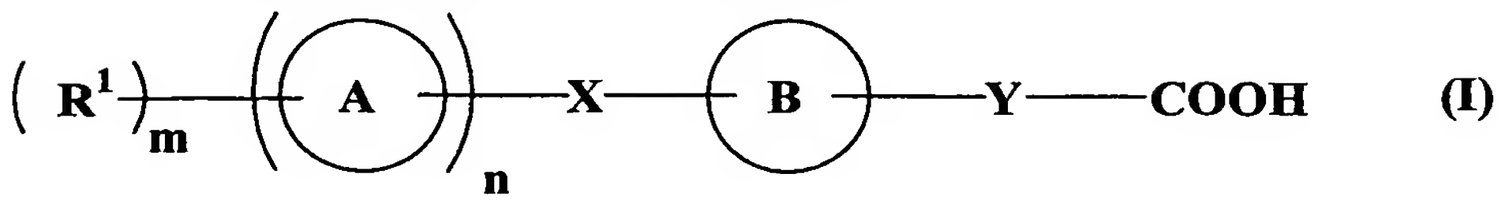
CLAIMS

1. A compound represented by formula (I):



wherein ring A represents a cyclic group;

ring B represents a cyclic group which may further have a substituent(s);

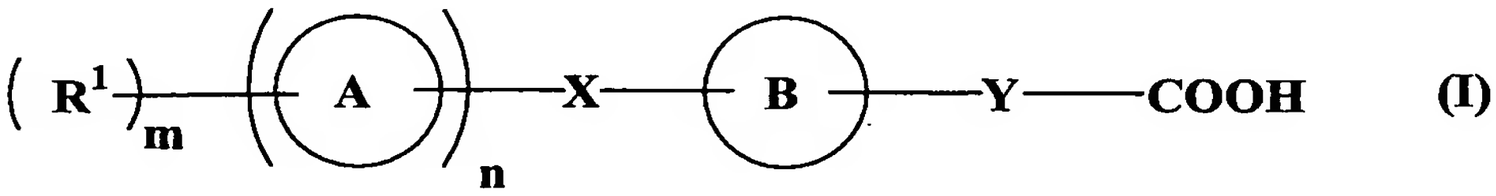
X represents a bond or a spacer having 1 to 8 atoms in its main chain in which one atom in the spacer may be taken together with a substituent on ring B to form a ring group which may have a substituent(s);

Y represents a bond or a spacer having 1 to 10 atoms in its main chain in which one atom in the spacer may be taken together with a substituent on ring B to form a ring group which may have a substituent(s);

n represents 0 or 1, wherein when n is 0, m is 1 and R^1 represents a hydrogen atom or a substituent, and when n is 1, m is 0 or an integer of 1 to 7 and R^1 represents a substituent in which when m is 2 or more, plural R^1s are the same or different,

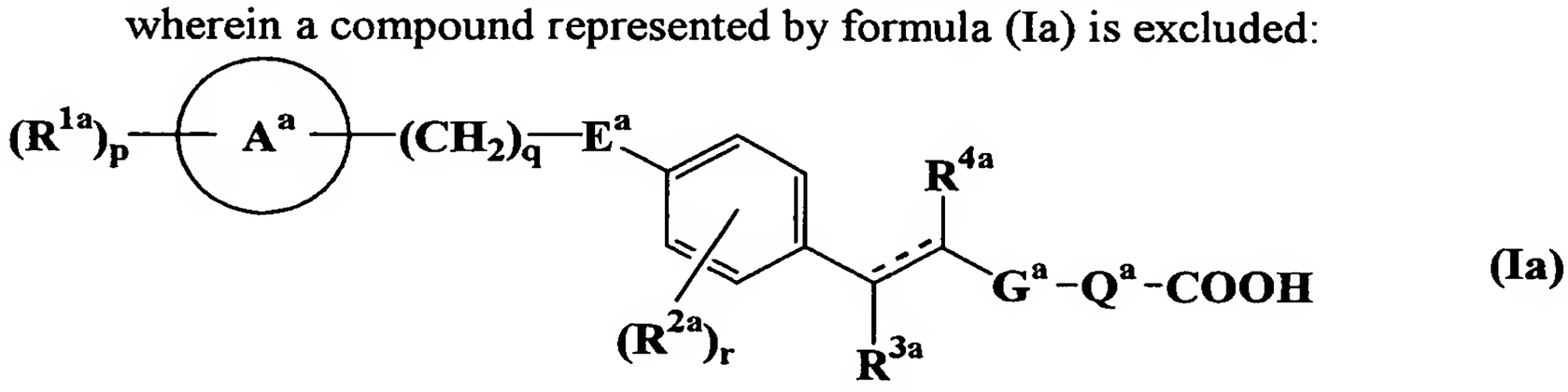
a salt thereof, a solvate thereof or a prodrug thereof.

2. The compound according to claim 1, which is a compound represented by formula (I):



wherein all symbols have the same meanings as in claim 1, and

wherein a compound represented by formula (Ia) is excluded:



wherein R^{1a} represents C1-8 alkyl, C1-8 alkoxy, a halogen atom, nitro or trifluoromethyl;

ring A^a represents a C5-7 monocyclic carbocyclic group or a 5- to 7-membered monocyclic heterocyclic group containing one or two nitrogen atoms, one oxygen atom and/or one sulfur atom;

E^a represents $-CH_2-$, -O-, -S- or $-NR^{6a}-$, in which R^{6a} represents a hydrogen atom or C1-8 alkyl;

R^{2a} represents C1-8 alkyl, C1-8 alkoxy, a halogen atom, nitro or trifluoromethyl;

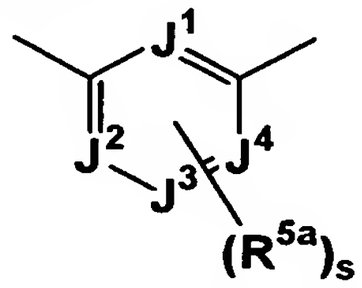
R^{3a} represents a hydrogen atom or C1-8 alkyl;

R^{4a} represents a hydrogen atom or C1-8 alkyl, or

R^{2a} and R^{4a} may be taken together to form $-CH_2CH_2-$ or -CH=CH-;

G^a represents $-CONR^{7a}-$, $-NR^{7a}CO-$, $-SO_2NR^{7a}-$, $-NR^{7a}SO_2-$, $-CH_2NR^{7a}-$ or $-NR^{7a}CH_2-$, in which R^{7a} represents a hydrogen atom, C1-8 alkyl, Cyc1 or C1-8 alkyl substituted with Cyc1, and Cyc1 represents a C5-7 monocyclic carbocyclic group or a 5- to 7-membered monocyclic heterocyclic group containing one or two nitrogen atoms, one oxygen atom and/or one sulfur atom;

Q^a represents C1-4 alkylene or



wherein J^1, J^2, J^3 and J^4 each independently represents a carbon atom or a nitrogen atom in which the number of the nitrogen atom(s) is 2 or less; R^{5a} represents (1) C1-8 alkyl, (2) a halogen atom, (3) nitro, (4) cyano, (5) trifluoromethyl, (6) trifluoromethoxy, (7) phenyl, (8) tetrazolyl, (9) $-OR^{9a}$, (10) $-SR^{10a}$, (11) $-COOR^{11a}$, (12) $-NR^{12a}R^{13a}$, (13) $-CONR^{14a}R^{15a}$, (14) $-SO_2NR^{16a}R^{17a}$, (15) $-NR^{18a}COR^{19a}$, (16) $-NR^{20a}SO_2R^{21a}$, (17) $-SO_2R^{22a}$, or (18) $-OP(O)(OR^{23a})_2$, in which R^{9a} to R^{18a}, R^{20a} and R^{23a} each independently represents a hydrogen atom, C1-8 alkyl, Cyc2 or C1-8 alkyl substituted with Cyc2, or R^{12a} and R^{13a}, R^{14a} and R^{15a}, or R^{16a} and R^{17a} may be taken together with a nitrogen atom to which they are bound, to form a 5- to 7-membered monocyclic heterocyclic group containing one or two nitrogen atoms, one oxygen atom and/or one sulfur atom, in which the heterocyclic group may be substituted with C1-8 alkyl, hydroxy or amino; R^{19a} and R^{21a} each independently represents C1-8 alkyl, Cyc2 or C1-8 alkyl substituted with Cyc2; R^{22a} represents hydroxy, C1-8 alkyl, Cyc2 or C1-8 alkyl substituted with Cyc2; and Cyc2 represents a C5-7 monocyclic carbocyclic group or a 5- to 7-membered monocyclic heterocyclic group containing one or two nitrogen atoms, one oxygen atom and/or one sulfur atom;

p represents 0 or an integer of 1 to 5;

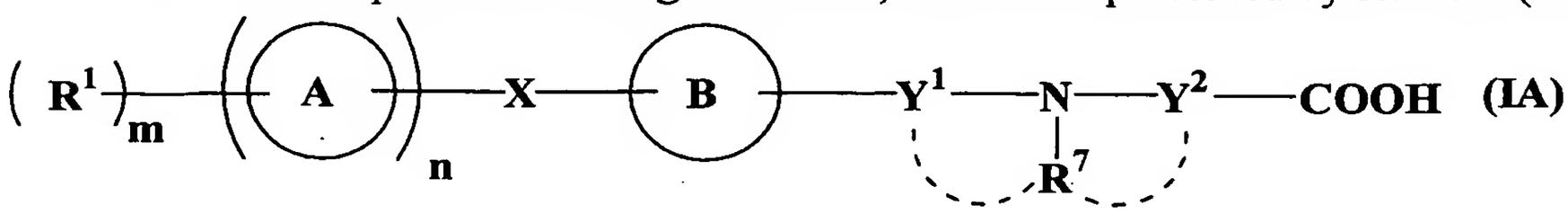
q represents an integer of 4 to 6;

r represents 0 or an integer of 1 to 4;

s represents 0 or an integer of 1 to 4; and

$\overline{\text{----}}$ represents a single bond or a double bond.

3. The compound according to claim 2, which is represented by formula (IA):



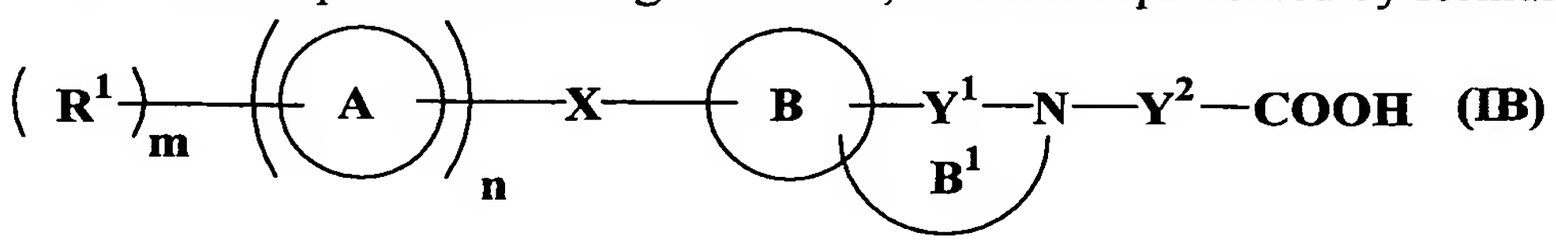
(IA)

wherein Y^1 and Y^2 each independently represents a bond or a spacer having 1 to 9 atoms in its main chain in which the total atom number of the main chains of Y^1 and Y^2 is 9 or less;

R^7 represents a hydrogen atom or a substituent, or may be taken together with one atom in the spacer represented by Y^1 and/or Y^2 to form a nitrogen-containing heterocyclic group which may have a substituent(s); and

other symbols have the same meanings as described in claim 1.

4. The compound according to claim 2, which is represented by formula (IB):



(IB)

wherein ring B^1 represents a nitrogen-containing heterocyclic group which may have a substituent(s) in which a nitrogen atom in the spacer represented by Y is taken together with a substituent on ring B and Y^1; and

other symbols have the same meanings as described in any one of claims 1 and 3.

5. The compound according to claim 2, wherein ring A is a benzene, indane, indene or naphthalene ring.

6. The compound according to claim 2, wherein ring B is a C5-12 monocyclic or bicyclic carbocyclic group which may have a substituent(s).

7. The compound according to claim 6, wherein ring B is a benzene or naphthalene ring which may have a substituent(s).

8. The compound according to claim 2, wherein ring B is a 5- to 12-membered monocyclic or bicyclic heterocyclic group which contains 1 to 3 hetero atoms selected

from an oxygen atom, a nitrogen atom and a sulfur atom and may be partially or fully saturated.

9. The compound according to claim 2, wherein ring B is a dihydronaphthalene, indene, 6,7-dihydro-5H-benzo[7]annulene, pyridine, indole, chromene, benzofuran, benzothiophene, benzoxazole, dihydrobenzoxepine, tetrahydroisoquinoline, isoindoline or tetrahydrobenzazepine ring which may have a substituent(s).

10. The compound according to claim 4, wherein the nitrogen-containing heterocyclic group represented by ring B^1 is a pyrrole, tetrahydropyridine, dihydropyrrole or tetrahydroazepine ring.

11. The compound according to claim 2, wherein X is a divalent group having 1 to 8 atoms in its main chain which is 1 to 4 combinations selected from the group consisting of C1-8 alkylene which may be substituted, C2-8 alkenylene which may be substituted, a nitrogen atom which may be substituted, -CO-, -O-, C3-6 cycloalkylene which may be substituted and phenylene which may be substituted.

12. The compound according to claim 11, wherein X is $-CH_2-$, $-(CH_2)_2-$, $-(CH_2)_3-$, $-(CH_2)_4-$, $-(CH_2)_5-$, $-(CH_2)_6-$, $-(CH_2)_7-$, $-(CH_2)_8-$, $-CH_2-O-$, $-(CH_2)_2-O-$, $-(CH_2)_3-O-$, $-(CH_2)_4-O-$, $-(CH_2)_5-O-$, $-CH=CH-CH_2-O-$ or -cyclopropylene-CH_2-O-, which each may be substituted, in which the right side of each group is bound to ring B.

13. The compound according to claim 2, wherein Y is a divalent group having 1 to 10 atoms in its main chain which is 1 to 4 combinations selected from the group consisting of C1-10 alkylene which may be substituted, C2-10 alkenylene which may be substituted, C2-10 alkynylene which may be substituted, a nitrogen atom which may be substituted, -CO-, -O-, -S-, phenylene which may be substituted, -(aziridine which may be substituted)-, -(azetidine which may be substituted)-, -(pyrrolidine which may be substituted)-, -(piperidine which may be substituted)-, -(piperazine which may be substituted)- and -(tetrahydropyridine which may be substituted)-.

14. The compound according to claim 13, wherein Y is $-(CH_2)_3-NHCH_2-$, $-(CH_2)_3-NCH_3-CH_2-$, $-(CH_2)_3-NH-(CH_2)_2-$, $-(CH_2)_2-NH-(CH_2)_2-$, $-(CH_2)_2-CONHCH_2-$, $-(CH_2)_2-CONH-$(m-phenylene)-, $-CR^{Y1}=CH-CH_2-NH-(CH_2)_4-$, $-CR^{Y1}=CH-$

CH_2-NH-$(CH_2)_5$-, -CR^{Y1}=CH-CH_2-NH-$(CH_2)_2$-, -CH=CR^{Y1}-CH_2-NH-$(CH_2)_2$-, -CR^{Y1}=CH-CH_2-NH-CH_2-, -CH_2-(azetidine)-, -$(CH_2)_2$-(azetidine)-, -$(CH_2)_3$-(azetidine)-, -CR^{Y1}=CH-CH_2-(azetidine)-, -CH=CR^{Y1}-CH_2-(azetidine)-, -$(CH_2)_3$-(piperidine)- or -CR^{Y1}=CH-CH_2-(piperidine)-, which each may be substituted, in which R^{Y1} represents a hydrogen atom, a halogen atom or C1-4 alkyl which may be substituted with 1 to 3 halogen atoms, and the right side of each group is bound to ring B.

15. The compound according to claim 3, wherein Y^1 is a divalent group having 1 to 4 atoms in its main chain which is 1 to 4 combinations selected from the group consisting of C1-3 alkylene and -CO-.

16. The compound according to claim 15, wherein Y^1 is -CH_2-, -$(CH_2)_2$-, -$(CH_2)_2$-CO-, -CO-$(CH_2)_2$- or -$(CH_2)_3$-, which each may be substituted.

17. The compound according to claim 3, wherein Y^2 is a divalent group having 1 to 5 atoms in its main chain which is 1 to 4 combinations selected from the group consisting of C1-3 alkylene which may be substituted and phenylene which may be substituted.

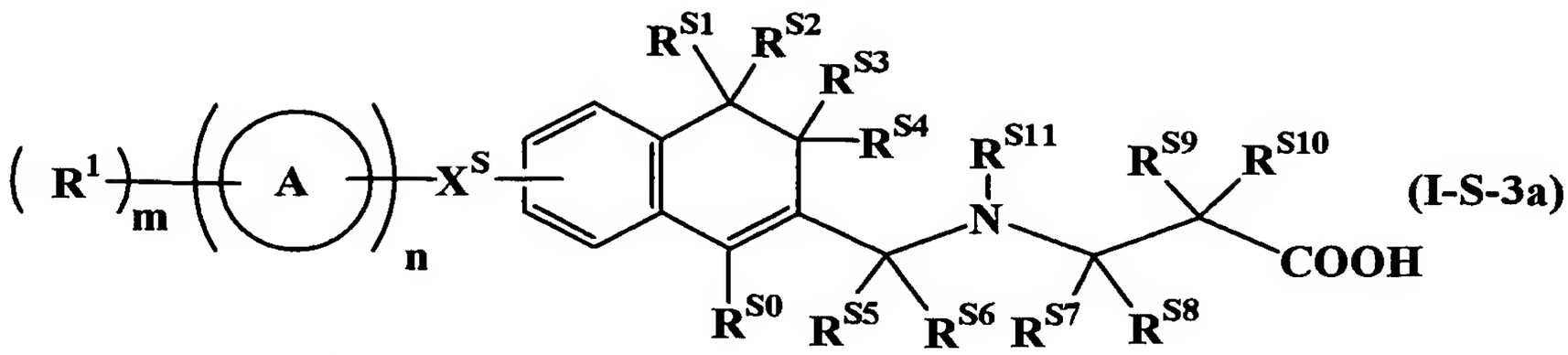
18. The compound according to claim 17, wherein Y^2 is -CH_2-, -$(CH_2)_2$- or -(m-phenylene)-, which each may be substituted.

19. The compound according to claim 2, wherein the substituent represented by R^1 is a halogen atom, C1-20 alkyl which may be substituted, or C1-20 alkyloxy which may be substituted.

20. The compound according to claim 19, wherein the substituent represented by R^1 is fluoro, chloro, bromo, methyl, trifluoromethyl or methoxy.

21. The compound according to claim 3, wherein R^7 is a hydrogen atom or C1-20 alkyl which may be substituted.

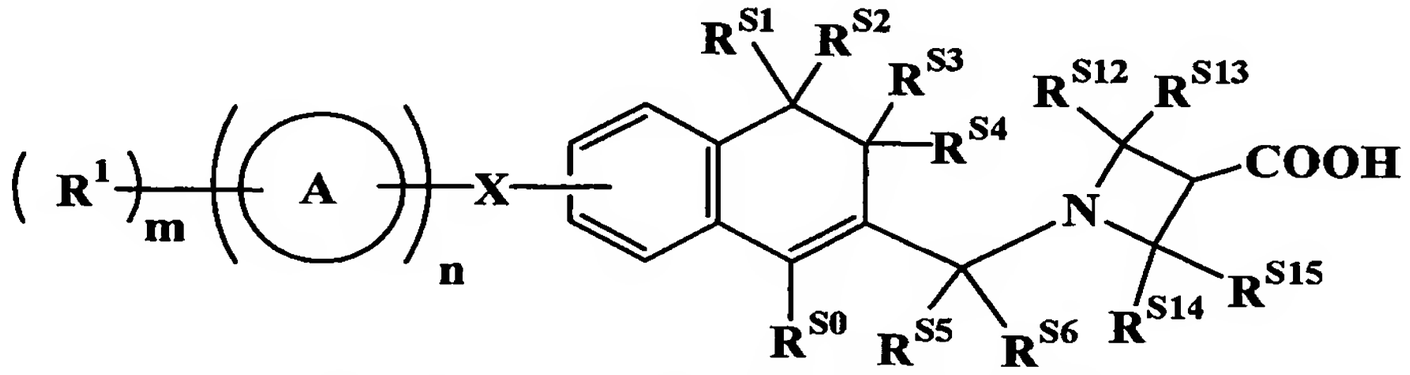
22. The compound according to claim 2, which is a compound represented by formula (I-S-3a):



(I-S-3a)

wherein X^S has the same meaning as X described in claim 1, in which X^S is not $-(CH_2)_q-E^a-$; R^{S0}, R^{S1}, R^{S2}, R^{S3}, R^{S4}, R^{S5}, R^{S6}, R^{S7}, R^{S8}, R^{S9}, R^{S10} and R^{S11} each independently represents a hydrogen atom, a halogen atom, or C1-4 alkyl which may be substituted with 1 to 3 halogen atoms; E^a, q and other symbols have the same meanings as described in any one of claims 1 and 2, or

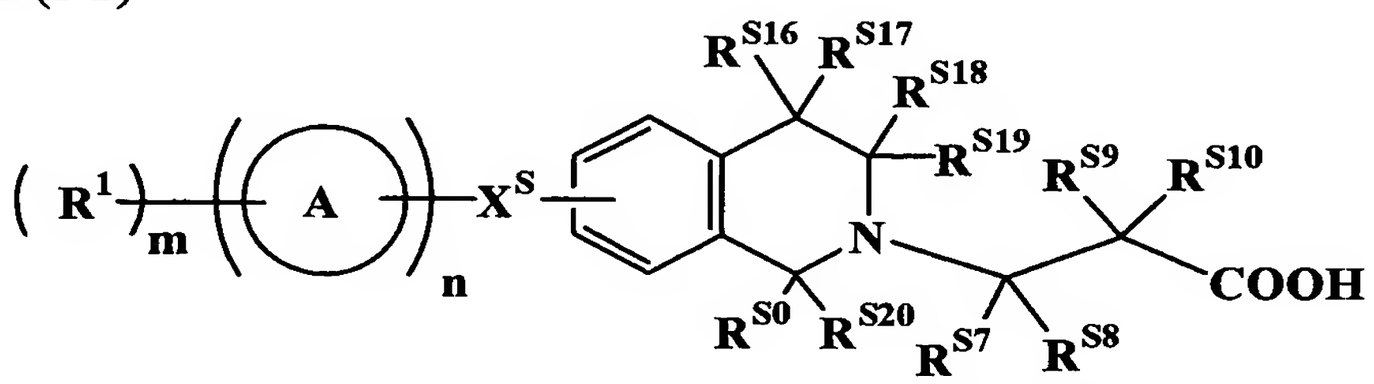
formula (I-S-7a):



(I-S-7a)

wherein R^{S0}, R^{S1}, R^{S2}, R^{S3}, R^{S4}, R^{S5} and R^{S6} each has the same meaning as described above; R^{S12}, R^{S13}, R^{S14} and R^{S15} each independently represents a hydrogen atom, a halogen atom, or C1-4 alkyl which may be substituted with 1 to 3 halogen atoms; E^a, q and other symbols have the same meanings as described in any one of claims 1 and 2.

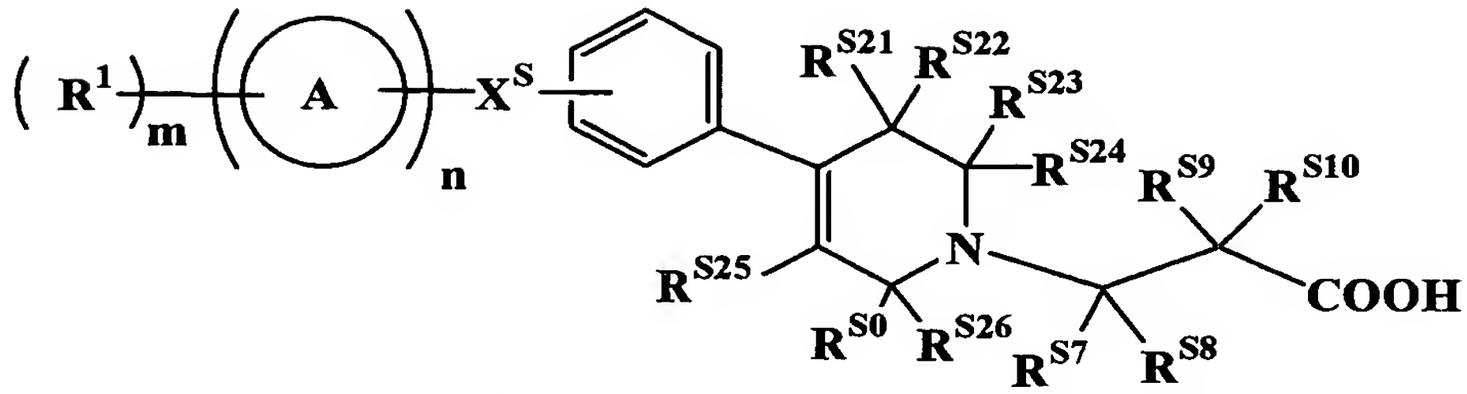
23. The compound according to claim 2, which is a compound represented by formula (I-T):



(I-T)

wherein R^{S16}, R^{S17}, R^{S18}, R^{S19} and R^{S20} each independently represents a hydrogen atom, a halogen atom, or C1-4 alkyl which may be substituted with 1 to 3 halogen atoms; and other symbols have the same meanings as described in any one of claims 1, 2 and 22.

24. The compound according to claim 2, which is a compound represented by formula (I-U):



(I-U)

wherein R^{S21}, R^{S22}, R^{S23}, R^{S24}, R^{S25} and R^{S26} each independently represents a hydrogen atom, a halogen atom, or C1-4 alkyl which may be substituted with 1 to 3 halogen atoms; and other symbols have the same meanings as described in any one of claims 1, 2 and 22.

25. The compound according to claim 2, which is

(1) N-{(2E)-3-[4-(3-phenylpropoxy)phenyl]prop-2-enyl}-β-alanine,

(2) N-{[6-(3-phenylpropoxy)-2-naphthyl]methyl}-β-alanine,

(3) 1-{[6-(3-phenylpropoxy)-2-naphthyl]methyl}azetidine-3-carboxylic acid,

(4) 1-{[6-(3-phenylpropoxy)-2-naphthyl]methyl}piperidine-4-carboxylic acid,

(5) N-{(2E)-3-[2-methyl-4-(3-phenylpropoxy)phenyl]prop-2-enyl}-β-alanine,

(6) 1-{(2E)-3-[4-(3-phenylpropoxy)phenyl]-2-propenyl}piperidine-4-carboxylic acid,

(7) 1-{(2E)-3-[4-(3-phenylpropoxy)phenyl]-2-propenyl}azetidine-3-carboxylic acid,

(8) N-{3-[4-(3-phenylpropoxy)phenyl]propyl}-β-alanine,

(9) 3-({(2E)-3-[4-(3-phenylpropyl)phenyl]-2-butenyl}amino)propanoic acid,

(10) 3-({(2E)-3-[4-(3-cyclohexylpropoxy)-2-methylphenyl]-2-propenyl}amino)propanoic acid,

(11) 1-{[1-methyl-6-(4-phenylbutoxy)-3,4-dihydro-2-naphthalenyl]methyl}-3-azetidinecarboxylic acid,

(12) N-{[1-(5-phenylpentyl)-1H-indol-5-yl]methyl}-β-alanine,

(13) 3-[4-[4-(3-phenylpropoxy)phenyl]-3,6-dihydropyridin-1(2H)-yl]propanoic acid,

(14) 1-(6-[3-(4-chlorophenyl)propoxy]-1-methyl-3,4-dihydro-2-naphthalenylmethyl)-3-azetidinecarboxylic acid, or

(15) 1-(6-[3-(4-fluorophenyl)propoxy]-1-methyl-3,4-dihydro-2-naphthalenylmethyl)-3-azetidinecarboxylic acid.

26. The compound according to claim 1, which is

(1) N-((2E)-3-{2-methyl-4-[(5-phenylpentyl)oxy]phenyl}prop-2-enyl)-β-alanine,

(2) N-((2E)-3-{4-[(5-phenylpentyl)oxy]phenyl}-2-propenyl)-β-alanine, or

(3) 3-({[1-methyl-6-(4-phenylbutoxy)-3,4-dihydro-2-naphthalenyl]methyl}amino)propanoic acid.

27. A pharmaceutical composition which comprises a compound represented by formula (I) in claim 1, a salt thereof, a solvate thereof or a prodrug thereof.

28. The pharmaceutical composition according to claim 27, which is an S1P receptor binding agent.

29. The pharmaceutical composition according to claim 28, which is an EDG-6 binding agent which may have an ability to bind to EDG-1.

30. The pharmaceutical composition according to claim 29, wherein the EDG-6 binding agent which may have an ability to bind to EDG-1 is an EDG-6 agonist which may have an agonistic activity against EDG-1.

31. The pharmaceutical composition according to claim 27, which is an agent for preventing and/or treating a disease related to EDG-1 and/or EDG-6.

32. The pharmaceutical composition according to claim 31, wherein the disease related to EDG-1 and/or EDG-6 is rejection in transplantation, autoimmune disease and/or allergic disease.

33. The pharmaceutical composition according to claim 31, wherein the disease related to EDG-1 and/or EDG-6 is rejection in transplantation of kidney, liver, heart, lung, dermal graft, cornea, bone, bone marrow cells and/or pancreatic islet cells, collagen disease, systemic lupus erythematosus, rheumatoid arthritis, multiple sclerosis, psoriasis, inflammatory bowel disease, Crohn's disease, autoimmune diabetes, lung fibrosis, atopic dermatitis and/or asthma.

34. The pharmaceutical composition according to claim 27, which is an immunosuppressant agent.

35. The pharmaceutical composition according to claim 27, which is an agent causing lymphopenia.

36. The pharmaceutical composition according to any one of claims 28, 31, 34 and 35, which comprises

(1) 2-[3-(4-(5-phenylpentyloxy)phenyl)propanoylamino]acetic acid,

(2) 3-[3-(4-(5-phenylpentyloxy)phenyl)propylamino]propanoic acid,

(3) 3-[2-(4-(5-phenylpentyloxy)phenyl)ethylamino]propanoic acid,

(4) 2-[3-(4-(5-phenylpentyloxy)phenyl)propylamino]acetic acid,

(5) 2-[N-methyl-3-(4-(5-phenylpentyloxy)phenyl)propylamino]acetic acid,

(6) N-((2E)-3-{2-methyl-4-[(5-phenylpentyl)oxy]phenyl}prop-2-enyl)-β-alanine,

(7) N-((2E)-3-{4-[(5-phenylpentyl)oxy]phenyl}-2-propenyl)-β-alanine,

(8) 3-({[1-methyl-6-(4-phenylbutoxy)-3,4-dihydro-2-naphthalenyl]methyl}amino)propanoic acid,

(9) 3-carboxyl-5-[3-(4-(5-phenylpentyloxy)phenyl)propanoylamino]benzoic acid, or

(10) 2-chloro-5-[3-(2-fluoro-4-(5-phenylpentyloxy)phenyl)propanoylamino]benzoic acid,

a salt thereof, a solvate thereof or a prodrug thereof.

37. A medicament comprising the compound represented by formula (I) according to claim 1, a salt thereof, a solvate thereof or a prodrug thereof in combination with one or at least two selected from the group consisting of an antimetabolite, an alkylating agent, a T cell activation inhibitor, a calcineurin inhibitor, a proliferation signal inhibitor, a steroid, an immunosuppressant agent, an antibody used in immune suppression, an agent for treating rejection, an antibiotic, an antiviral agent and an antifungal agent.

38. An immunosuppressant agent and/or an agent causing lymphopenia, which comprises a compound which has an ability to bind to EDG-6 and may have an ability to bind to EDG-1.

39. The immunosuppressant agent and/or the agent causing lymphopenia according to claim 38, which is an agent for preventing and/or treating rejection in transplantation, autoimmune disease and/or allergic disease.

40. A method for preventing and/or treating a disease related to EDG-1 and/or EDG-6 in a mammal, which comprises administering to a mammal an effective amount of the compound represented by formula (I) according to claim 1, a salt thereof, a solvate thereof or a prodrug thereof.

41. A method for immune suppression and/or lymphopenia in a mammal, which comprises administering to a mammal an effective amount of the compound represented by formula (I) according to claim 1, a salt thereof, a solvate thereof or a prodrug thereof.

42. Use of the compound represented by formula (I) according to claim 1, a salt thereof, a solvate thereof or a prodrug thereof for the manufacture of a medicament for preventing and/or treating a disease related to EDG-1 and/or EDG-6.

43. Use of the compound represented by formula (I) according to claim 1, a salt thereof, a solvate thereof or a prodrug thereof for the manufacture of an immunosuppressant agent and/or an agent causing lymphopenia.